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10 Agricultural Water Conservation and Development

Agriculture is a unique industry in the Kanab Creek/Virgin River Basin of Utah. The climate is milder and the diversity of crop production is greater than other areas of the state. Double cropping is also possible. About the only thing in common with most of the state are the chronic water shortages.

10.1 Introduction

This section describes the agricultural industry in this hydrologic basin. It also discusses the problems and needs and areas of potential development.

Even though this is one of the fastest growing areas in the state, agriculture continues to be an important part of the economy. Spinoff from agriculture helps support employment and production in other industries and maintains economic diversity.

10.2 Background

Less than two percent of the total land area is used as cropland primarily because of topographic restrictions; arable areas are not irrigated because of water limitations. See Section 5.3 for data on water supply. Nearly all of the land area is suitable for grazing, although not all of it is utilized. Typically, the irrigated cropland is confined to the bottom land areas along the rivers and streams. Much of the non-irrigated, dry cropland areas are located in the higher mountain valleys and benches where arable land and adequate precipitation occurs. See Section 3.3.2 for a discussion on climate. Rangeland is found from the low lying desert areas to the high mountain forest lands (See Section 3.3.4).

The number of farms has tended to increase over the last 10-15 years. This has been accompanied by a decrease in the average farm size. The total land acreage in farms increased between 1982 and 1987.[2] The irrigated cropland acreages have increased in Iron and Kane counties but decreased in Washington County. The total irrigated area has increased, especially in the last 15 years. These trends reflect the change from full-time farming to part-time operator with an outside job and an

increasing number of hobby farms or ranchettes. These changes will continue as more people move into the basin to spend their retirement years.

Each year, some cropland is converted to non-agricultural uses. This will continue. Boundaries of incorporated cities will continue to expand, infringing on present agricultural areas. Some new cropland in scattered tracts has been recently developed. However, water supplies are limited, so it is not likely many more new areas will be brought into production.

Cattle is the major farming industry. This industry consists of cow-calf operations with some beef production and dairies. Most of the crops grown are used to support these activities as are pasture and range lands.

There is some increase in water use per unit (tons, bushels, AUMs) of production in the warmer climates. The production per unit of resources utilized also increases because of the climate. For instance, five or more crops of alfalfa can be grown in the St. George area. At the same time, only three crops can be produced in the Orderville area. In the case of small grains, the same amount of water is required to grow a mature crop regardless of location.

10.3 Policy Issues and Recommendations

The policy issues revolving around the agricultural industry include maintaining the land base, reducing irrigation water supply shortages and watershed protection.

10.3.1 Agricultural Land Base

Issue - Agricultural lands are subject to conversion for other uses.

Discussion - The possibility of losing considerable agricultural land base could impact the rural economy. It is estimated about 7,000 acres will be lost to other uses. The rapidly increasing population requires more land for new residential developments. These developments are sometimes located in agricultural cropland areas and on a random basis. This isolates other tracts of agricultural land. As city corporate boundaries are expanded, they often include some of these tracts, complicating the operation of the cities and agriculture.

Consideration should be given to making federal and state administered lands available to ease this pressure. This can be accomplished by exchange or purchase. Many higher elevation fringe areas around the agricultural cropland are more suited to housing developments. Foundations are more stable and views are more enjoyable.

Another consideration is the right of land owners to make decisions regarding their property. Consideration should be given to farmland easement leases and development right purchases giving farmers alternative choices. This would allow the land to remain in agricultural production and provide open green space along with financial incentives.

Recommendation - City and county planners should prepare long-range plans to control sprawling development, particularly avoiding agricultural areas when possible. Zoning committees should avoid allowing indiscriminate variations where the viability of farmland operations would be affected.

10.3.2 Agricultural Water Supply Shortages

Issue - Irrigation companies depending on direct flow water rights from rivers and

streams are susceptible to late season shortages.

Discussion - The Kane and Washington counties water conservancy districts and irrigation companies need to pursue development of multipurpose projects to provide a more stable supply for late season irrigation use. Increased water storage volumes can also dampen year to year effects of dry and wet cycles.

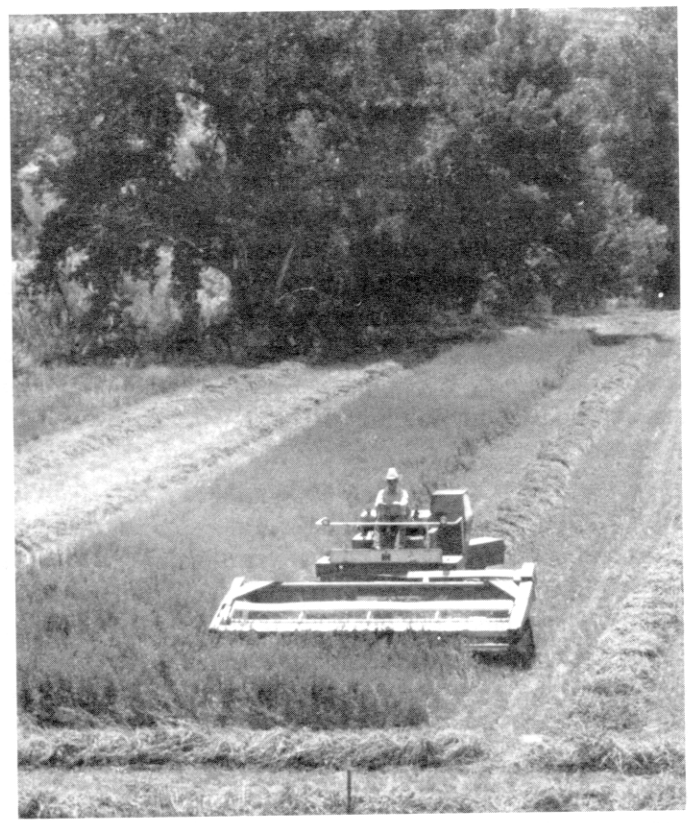
Improved use efficiencies can increase the irrigation water supply available by reducing deep percolation and excess tailwater. This can also be accomplished by improvement and timely maintenance and repair of diversion and conveyance facilities to reduce the loss of water available to individual irrigation companies. Onfarm irrigation best management practices can be a boon to efficient water conservation goals as well as increasing profits to farmers. See Table 10-6 for irrigation water use. Water users should encourage partnerships between irrigation companies and municipal and industrial organizations to improve off-farm and onfarm efficiencies for possible water exchanges. See Section 17 for further conservation discussions.

Recommendation - Irrigation companies, with assistance from Kane and Washington counties water conservancy districts and state and federal agencies, should move to protect and improve their water supplies by implementing water conservation programs and multipurpose projects when possible. Local soil conservation districts should assist by implementing and actively promoting these options.

10.3.3 Watershed Management

Issue - Many areas of severe and critical erosion exist in watersheds of the basin.

Discussion - Excessive sediment yield from both natural source areas and man's activities result in lower value wildlife habitat, degraded fishery values, less rangeland forage for grazing and higher treatment costs for M&I water. It indicates some lands are out of ecological balance, particularly in sensitive areas of the upland, desert and riparian zones of the watersheds.



The potential exists to improve the watershed conditions of these lands, reduce erosion and sediment and at the same time increase forage available for wildlife and livestock. Technical, educational and financial help is available through the Soil Conservation Commission's (SCC) Agricultural Resource Development Loan (ARDL) program. It assists ranchers and farmers and other private land owners to improve rangeland, cropland, wetlands and riparian zones.

Close coordination among agencies and organizations operating existing reservoirs or proposing to build new storage facilities is needed. Improvement of the watershed above these structures could be carried out to maximize use of available resources.

Recommendation - The Utah Soil Conservation Commission and its local soil conservation districts, working closely with the Soil Conservation Service, Forest Service, Bureau of Land Management and private land owners, should evaluate all lands of the watersheds for improvement projects. The Soil Conservation Service should vigorously pursue the current PL-566 Orderville-Muddy Creek Watershed Project and the Toms Canyon Flood Hazard Analysis.

10.4 Agricultural Lands

Lands used for agriculture cover a major portion of the Kanab Creek/Virgin River Basin. These lands are in all kinds of ownership and administration categories: private, tribal, state and federal. Table 10-1 shows the land areas owned and administered by the various entities with estimated acres of agricultural use. Only six percent of the total lands have soils suitable for cultivation. The balance is suitable for grazing only. See Tables 3-1 and 3-2 for basinwide land status data.

Lands used for farming can also be defined according to their agricultural production ability and potential. There are two categories: prime farmlands and farmland of statewide importance. The definitions for farmland of statewide importance have been modified for application to the state of Utah. Land designated as prime may not be the most productive in the county. It will, however, have the best combination of physical and chemical characteristics for producing food, feed, forage and fiber crops. To insure long-term production, these lands must be managed according to their inherent capabilities. There are about 17,000 acres of prime farmland and 26,000 acres of farmland of statewide importance.[4,5]

Prime farmlands have:

1. An adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity and alkalinity, acceptable salt and sodium content and few or no rocks. A dependable water supply is one in which enough water is available eight out of 10 years.

2. A mean annual temperature higher than 32° F at a depth of 20 inches. Summer temperature of the soil is warmer than 59° F at a depth of 20 inches.

3. A pH value between 4.5 and 8.4 above a depth of 40 inches.

4. A water table that is maintained at a sufficient depth during the cropping season to allow cultivated crops common to the area to be grown.

5. A salt content of less than 4 mmhos in the upper 40 inches of soil. Also, an

TABLE 10-1
AGRICULTURAL LAND OWNERSHIP AND ADMINISTRATION[5,8]

Status	Virgin River (acres)	(percent)	Kanab Creek and Johnson Wash (acres)	(percent)
Private	400,000	24.4	80,000	20.3
Tribal	28,000	1.7	-0-	-0-
State	140,000	8.6	37,000	9.4
Federal				
Forest Service	280,000	17.1	7,000	1.8
Bureau of Land Management	790,000	48.2	270,000	68.5
National Park Service	-0-	-0-	-0-	-0-
Total	1,638,000	00.0	394,000	100.0

exchangeable sodium percentage of less than 15 percent.

6. No flood hazard, or flooding less often than once in two years.

7. Minimal erosion danger; K (erodibility factor) times percent slope is less than 2.0 and I (soil erodibility) times C (climatic factor) does not exceed 60.

8. A permeability rate of at least 0.06 inches per hour in the upper 20 inches.

9. Less than 10 percent of the surface layer consisting of rock fragments coarser than three inches.

Farmland of statewide importance has:

1. A water supply sufficient to permit economic crop production in five out of 10 years.

2. Summer temperature of the soils warmer than 59° F at a depth of 20 inches.

3. A pH value between 4.5 and 8.6 above a depth of 20 inches and an exchangeable sodium percentage of less than 15 percent.

4. A water table that does not prevent the production of food, feed and forage crops.

5. No significant salt content (less than 4 mmhos, in the upper 20 inches of soil).

6. No flood hazard nor flooding more than once in two years.

7. The product of K (erodibility factor) times percent slope is 5 or less.

These lands do not qualify as prime farmland because they do not have adequate irrigation water, are on relatively steep slopes with moderate to high erosion hazards, have a high water table and /or have salt or alkali problems. In general, these soils require more management than prime farmlands if they are to achieve satisfactory and sustained economic production. Prime farmlands are included in lands of statewide importance.

Some statewide important soils, now used for partially irrigated crops, could become prime farmland with full irrigation. Certainly the inherent soil texture, slope and salinity levels indicate excellent agricultural potential.

10.4.1 Rangeland

Currently, approximately 15 percent of the rangeland is in good condition, 45 percent in fair condition, 15 percent in poor condition and 25 percent not rated. Present range productivity was computed from reconnaissance level inventory data, existing data from conservation plans of individual private ranches and data furnished by the Forest Service and Bureau of Land Management.

At the present level of range management, range condition and utilization efficiency, rangelands in the Virgin River drainage are producing approximately 75,000 Animal Unit Months (AUMs) of grazing for livestock and wildlife. The Kanab Creek and Johnson Wash areas are producing about 17,000 AUMs. Wildlife forage allocation values are about 32,100 AUMs for Washington County, including the Enterprise area, and about 15,000 AUMs for western Kane County. An AUM is the amount of forage needed to sustain one 1,000 pound cow and a calf for one month, in this case, 800 pounds. Observed utilization efficiencies were used to compute the estimated AUMs of grazing being produced. The estimated number of AUMs presently produced and potential AUMs with improvements in each watershed are shown in Table 10-2 (approximately 200,000 acres were not surveyed).

There are six distinct climatic zones in the area. These zones differ by amount of precipitation, temperature and growing season. These are the high mountain, mountain, upland, semidesert, semidesert (30) and desert climate zones. There are four azonal sites within these zones where the influence of water table, flooding or some other factor is strong enough to override climate (See Section 3.3.2, Climate).

Available AUMs vary from as low as 25 acres or more per AUM in the desert areas to two AUMs per acre in the high

TABLE 10-2
AUMS BY WATERSHED[5]

Watershed	Present (AUMs)	Potential (AUMs)
Beaver Dam Wash	14,100	16,000
Central Virgin River	25,900	33,000
East Fork Virgin River	400	700
Muddy Creek Watershed	1,100	7,000
Fort Pierce Wash	2,800	8,000
Gould Wash	2,600	5,500
North Fork Virgin River	14,900	22,000
Santa Clara River	13,300	18,000
Virgin River Basin Totals	75,100	110,200
Kanab Creek	15,000	a
Johnson Wash	b	a
Basin Total	90,100	110,200

[a]Data not available
[b]Included in Kanab Creek

mountains, and three to five AUMs per acre in wet pastures. The AUMs permitted depend on the range condition. There is potential to increase the use with improved watershed condition, although there are areas where increased forage production is not possible.

10.4.2 Irrigated Cropland

There are 25,600 acres of irrigated cropland in the basin. Irrigated crops grown are alfalfa and grass hay, 31 percent; small grains and corn silage, four percent; orchards and row crops, six percent; pasture and turf, 34 percent and idle land, 25 percent. Most of the crop production is used to support the livestock industry, although some alfalfa is shipped out of the area. Table 10-3 shows a more detailed breakdown. Table 10-4 shows the irrigated cropland acreage changes over time. Also see Table 5-12 for the current use of water by county for irrigated cropland.

There are about 3,000 acres of irrigated cropland in Arizona and 4,000 acres in Nevada. These are all in the Virgin River and Kanab Creek drainages. There is no irrigated cropland on Johnson Wash in Arizona.

TABLE 10-3
IRRIGATED LAND BY CROP[8]
(acres by county)

Crop	Washington	Iron	Kane	Total
Fruit/Nuts/Vineyards	730	0	71	801
Grain	826	0	126	952
Corn	60	0	9	69
Other row crops	725	0	0	725
Alfalfa	4,725	255	2,195	7,718
Grass hay	462	0	268	730
Pasture	4,863	659	2,639	8,161
Turf	125	3	0	128
Idle plowed	662	72	101	835
Idle overgrown	3,202	518	1,696	5,416
Pasture, surf. & sub. irr.	200	15	146	361
Surface Subtotal	16,623	1,522	7,251	25,396
Sub. Irr. Pasture	60	0	147	207
Total	16,683	1,522	7,398	25,603

10.4.3 Dry Cropland

Dry cropland covers about 21,300 acres. These lands are generally located at higher elevations where the precipitation is greater. The primary crop is small grain. Some areas are planted to exotic grasses to provide grazing for livestock.

10.5 Watershed Management

Watershed management is the protection, conservation and use of all the natural resources of a specific watershed to keep the soil mantle productive and in place; and to assure that water yield and water quality meet the existing and potential uses. If not properly protected, watershed lands are readily damaged from erosion, flood, sediment and fire. Following are some watershed treatment measures:

- Livestock and wildlife grazing management.
- Vegetation improvement of the cropland, rangeland, pastures, forest land, wetlands, riparian zones and other areas. Also, conservation tillage protection on cropland coordinated with grazing management. Improved cropping sequences,

TABLE 10-4[1,5,6,7]
IRRIGATED CROPLAND CHANGES

County/Drainage	1955	1978 (acres)	1991
Ash Creek	1,390	1,370	1,520
Iron County Total	**1,390**	**1,370**	**1,520**
Virgin River	2,380	1,730	2,430
Kanab Creek	1,350	11,550	2,300
Johnson Wash	1,130	1,370	2,670
Kane County Total	**4,860**	**4,650**	**7,400**
Virgin River	14,880	13,230	12,430
Santa Clara River	3,520	3,700	4,250
Washington County Total	**18,400**	**16,930**	**16,680**
Total	**24,650**	**22,950**	**25,600**

pasture and hayland management and improved irrigation systems and management are important.

- Structural measures, such as contour trenching, debris basins, gully control and stream channel stabilization, in conjunction with vegetation improvement and grazing management.

For the purpose of this plan, the basin has been divided into nine watershed units as shown in Figure 10-1. Table 10-5 gives the areas and describes their condition.

The basin is an area with a high degree of soil and rock erosion activity. The sediment yield conditions for the river basin can be viewed in relationship to percent of total surface area versus percent of total estimated sediment yield as follows:

CLASS 2 (high yield) - 12 percent of the total area is yielding 35 percent of the sediment;

CLASS 3 (moderate high yield) - 48 percent of the total area is yielding 51 percent of the sediment;

CLASS 4 (moderate yield) - 24 percent of the total area is yielding 12 percent of the sediment; and

CLASS 5 (low yield) - 16 percent of the total area is yielding two percent of the sediment.

Sediment and salt yields from the CLASS 2 (Critical Erosion) areas are at least three times the background geologic rate. This is due to man's activities, mostly grazing, along with wildlife use. This

FIGURE 10-1
Watershed Map

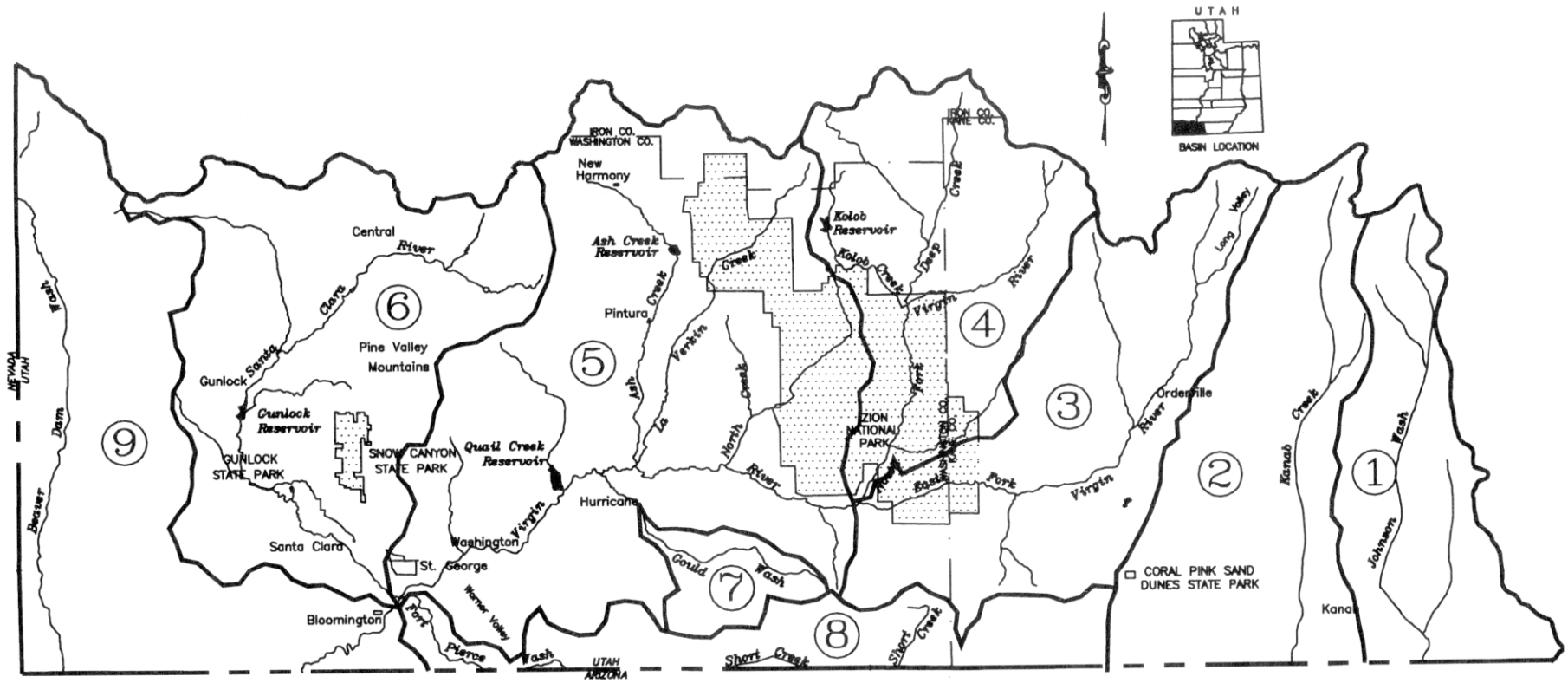


TABLE 10-5
WATERSHED CONDITION

Map No.	Name	Total Area (acres)	Range Condition (acres) Good	Fair	Poor
1	Johnson Wash	210,000	a	a	a
2	Kanab Creek	190,000	a	a	a
3	East Fork Virgin River	258,000	500	183,000	43,800
4	North Fork Virgin River	229,300	18,400	138,700	13,800
5	Central Virgin River	524,200	63,100	170,600	61,700
6	Santa Clara River	349,600	51,200	139,000	46,600
7	Gould Wash	38,700	12,100	7,300	11,500
8	Fort Pierce Wash	130,000	9,200	57,000	24,200
9	Beaver Dam Wash	301,200	110,500	122,300	25,200
	Total	2,231,000	265,000	817,900	226,800

[a]Data not available

Note: Rock outcrops, urbanized and other miscellaneous areas and unsurveyed areas not included.

excessive sediment is depleting the watershed values. It is reducing wildlife habitat, degrading fishery values, lowering water quality in the Colorado River Basin, increasing sediment and salt loading to the Colorado River and degrading the value of rangeland grazing.

The critical erosion areas for each of the watersheds are shown on Figure 10-2 and described below in general terms:

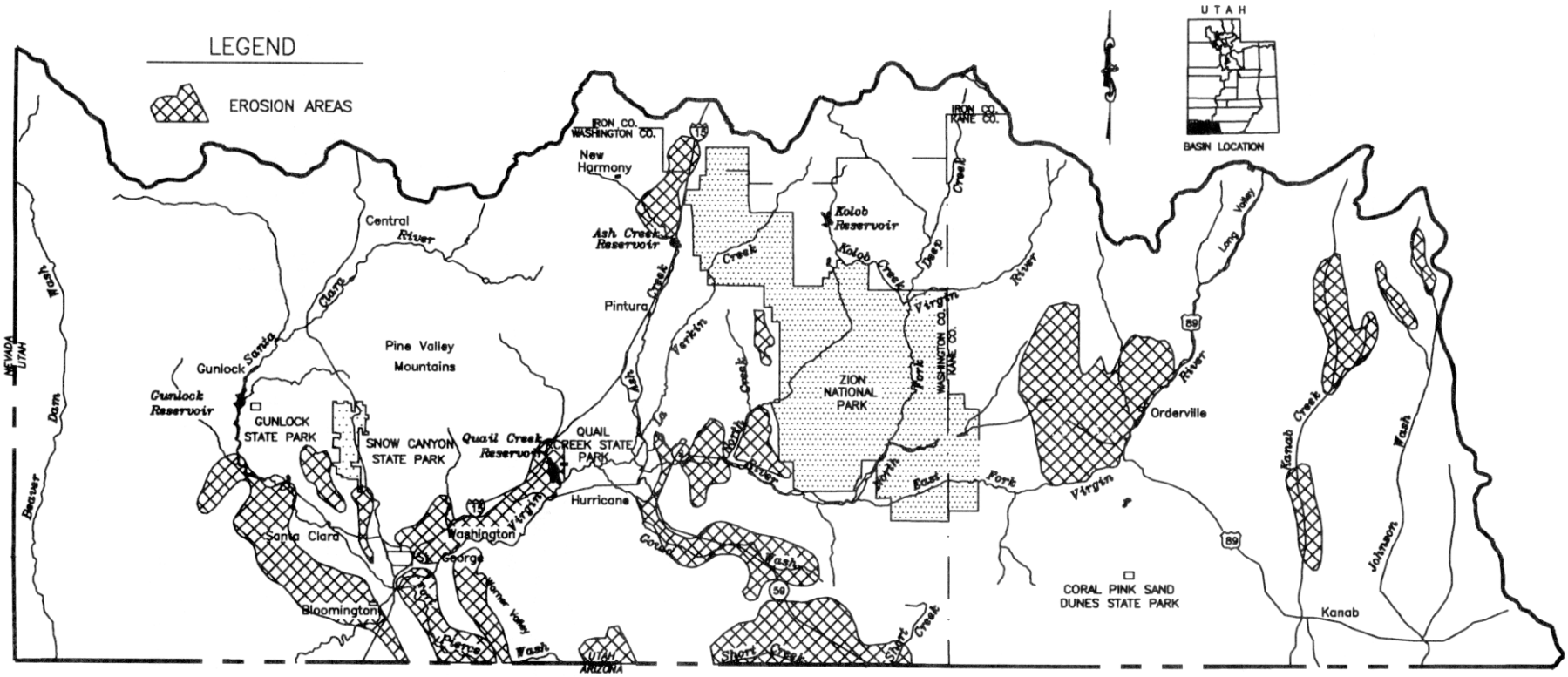
Kanab Creek and Johnson Wash - Data is not available, but there are critically eroding areas in both watersheds.

East Fork Virgin River - Critical erosion. Designated a priority watershed for non-point source pollution control. It also contains a Soil Conservation Service PL-566, small watershed protection project (the Orderville-Muddy Creek Watershed Erosion and Flood Control Project).

North Fork Virgin River - Contains many small areas of poor ecological condition lands.

Central Virgin River - Critical erosion, primarily in the lower reaches. Gypsum affects soils in the St. George/Bloomington area where there is an extremely sparse and

FIGURE 10-2
Critical Eroding Areas Map



fragile vegetative community. These are soils with severe erosion.

There is wind erosion in the New Harmony and Smith Mesa area on dry/arid areas.

Kolob Terrace has high natural erosion, but specific locations may have accelerated erosion from man-caused activities. These can be corrected.

Santa Clara River - Critical erosion in downstream locations. Western area of the upper watershed in poor ecological condition. Designated as a priority watershed for a non-point source pollution project.

Gould Wash - Critical erosion and excessive wind erosion in the Big Plains area where there is abandoned cropland.

Fort Pierce Wash - Critical erosion with high sediment yields and sand dunes in the Sand Mountain area.

Beaver Dam Wash - Critical erosion on the Virgin River drainage southwest of Bloomington.

10.6 Agricultural Water Problems and Needs

Currently, irrigation of crops depletes 51,300 acre-feet of water annually. Water budget and other background information has indicated there is an existing agricultural water deficit in the basin. For example, if all of the existing irrigated cropland (including idle land) with a valid water right were to receive a full water supply, an additional 19,000 acre-feet would be depleted. The water deficit can be reduced in many cases by reducing seepage and evaporation and improving irrigation efficiencies. It is not possible to salvage enough water from improved irrigation practices to meet the needs of all acres if they were planted to crops.

Many of the irrigation companies in the basin have already completed or have planned projects to improve overall irrigation efficiencies. The projects include reducing seepage losses by improving system management, lining canals and putting some canal sections in pipe. Projects to reduce onfarm losses include selecting a different irrigation method or improving an existing method. Operation and maintenance procedures have been recommended through conservation plans to many of the irrigation companies.

The agricultural use of water will change in the future. Some agricultural lands will be taken out of production and new replacement lands may be developed. It is estimated about 3,000 acres net of irrigated cropland will be converted to other uses by the year 2040. Projected irrigated areas, diversions and depletions for irrigated cropland are shown in Table 10-6.

In some areas, water quality may be impacted where livestock and wildlife concentrate for feeding and watering. There is a need to provide watering facilities to better distribute livestock and wildlife.

10.7 Agricultural Water Conservation and Development Alternatives

There are irrigation pipeline projects being planned to conserve water such as those in the Santa Clara and Bench Lake areas. Even if other projects are pursued, it is assumed the cropland acres will decrease. The crop types most likely to be converted to non-agricultural uses are alfalfa, pasture and grains.

TABLE 10-6
CURRENT AND PROJECTED IRRIGATED CROPLAND WATER USE

Year	Area[a] (Acres)	Diversions (acre-feet)	Depletions (acre-feet)
1990	25,600	123,300	51,300
2020	21,400	96,300	43,300
2040	18,600	80,000	37,600

aIncludes some idle land.

The improvement of conveyance system and onfarm irrigation efficiencies has been identified as some of the actions to conserve water. Three irrigation companies have the possibility of converting to pressure sprinkler irrigation systems. These are Pintura, Leeds and New Santa Clara.

A major project on the Fort Pierce Wash could provide storage for up to 16,000 acre-feet if water were available through importation from the Virgin River. This project would reduce the danger of flooding, provide water based recreation and create the possibility of moving cropland acres from the St. George area to the Warner Valley area. There are arable soils in Warner Valley that could be converted to irrigated agriculture uses. This project would include diverting water from the Virgin River, eight miles of canal, 14 miles of pipeline, and a dam on Fort Pierce Wash.

Bench Lake could be more efficient by completing distribution system improvements as could the St. George-Washington Canal by providing irrigation water on demand.

Pintura and Leeds should look towards pressure irrigation pipelines.

The Mt. Carmel and Toquerville systems currently have open ditches for irrigation water and should look into installing pipelines.

Orderville needs to improve its irrigation system and also provide flood control devices for the town.

New Santa Clara Irrigation Company should look into sprinkler systems, providing a new diversion and installing eight miles of irrigation water pipeline.

St. George - Santa Clara Irrigation Company should replace its open ditches with 13 miles of irrigation pipeline. Veyo also needs to replace three miles of irrigation ditches with pipeline.

There are several practices to increase the rangeland carrying capacity. These include watering troughs and fencing for better livestock distribution, vegetation improvement through pinon-juniper and brush removal followed by reseeding and mechanical erosion control. Erosion control measures include contour terracing and trenching, gully plugs and water spreading techniques. ■

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